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Knowledge and Skills Progression: Science

National Curriculum aims & purpose:		Curriculum intent - skills, attitudes and knowledge that we would like all children to develop on their journey through the school	
A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. Aims: • develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics • develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them • equip pupils with the knowledge required to understand the uses and implications of science, today and for the future		At the Fern Academy we want our children to have an interest in science and how it impacts our daily lives. We want them to constantly be asking questions, both 'big' and 'small', as they seek to better understand the world they live in and the fundamental scientific laws that govern it, from gravity to evolution to the way light travels. Moreover, we want to ensure that they understand the role that science (and scientists) has played in our past and how it will continue to play a vital role in our future, especially in the areas of healthcare and the environment. By the time that they leave education, we want all children to have become informed, curious, scientifically literate citizens, and our science curriculum is designed to build the broad foundations of that goal. During science lessons, we will ensure that children are given the opportunity to ask ambitious questions and then plan and conduct investigations with the aim of answering these questions. In Years 1 and 2 their natural curiosity should be encouraged and they will be given the opportunity to talk about what they have found out. In Years 3 and 4, children will explore, talk about, test and develop ideas and begin to make some decisions about which types of scientific enquiry would be most effective. In Years 5 and 6, they will encounter more abstract ideas and begin to recognise that scientific ideas change and develop over time. Children will draw conclusions, use evidence to justify their ideas and use their understanding to explain their findings. It is key that knowledge content and practical skills are taught hand-in-hand, with children developing and building on their factual knowledge as they journey through the school, making links between topics applying skills and understanding from previous learning to new areas as they are met. As part of this it is also vital that they are exposed to and specifically taught the essential scientific vocabulary related to each topic in order to demonstrate their knowledge and understanding effectively.	
Links to learning in EYFS:		Links to other subjects / curriculum areas:	Experiences and opportunities every child will have at Wellington Primary School:
<u>Understanding the World</u> • Comments and asks questions about aspects of their familiar world such as the place where they live or the natural world • Can talk about some of the things they have observed such as plants, animals, natural and found objects. • Talks about why things happen and how things work • Developing an understanding of growth, decay and changes over time • Shows care and concern for living things and the environment • Looks closely at similarities, differences, patterns and change		• Computing: Use ICT to collect data, analyse results and present findings • History - Study the lives and impact of famous scientists from the past • Geography - study animal habitats, weather systems, and rock formations from around the world. • Maths - Handle data and interpret results. • English - pose and write questions; present findings both verbally and in writing. • Art - use plants and animals in the local and wider environment as a starting point for art. Study scientific drawings, annotated sketches and diagrams from the past. • DT - build structures using a variety of materials, selected for their properties and effectiveness	• Observing a range of plants and animals first-hand, in the local environment, parks, garden centres, zoos and other animal centres. • Growing their own fruits and vegetables all the way through from seed to the plate. • Creating electrical circuits and watching something they have constructed respond to their commands. • Make things go 'bang', react vigorously and create new substances through chemical reactions. • Be surprised by what happens and excited about what they discover when working practically. • Make discoveries through trial and error - and not be afraid to get things wrong. • Ask 'big questions' about life and the universe.



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Knowledge and Skills Progression: Science

Opportunities to develop and use the school values in our curriculum

Curiosity	- Asking topic related questions and using different types of scientific enquiry to answer them - Looking at scientific evidence and using it to support or refute ideas and deepen understanding - Using scientific investigations to try out ideas, adapting the plan when things go wrong and exploring how changing variables can change the outcome - Closely observing the natural world around them using a range of equipment such as magnifying glasses and insect pooters
Independence	- Developing basic scientific enquiry skills so that children can undertake investigations with increasing independence - Planning their own scientific investigations, considering which variables to change and which to keep the same - Deciding how to report and present findings from enquiries, both in oral and written forms - Making their own predictions and drawing their own conclusions - Developing their own areas of interest within the science curriculum and finding opportunities to deepen learning through topic related books and websites
Empathy	- Considering the needs of all living things in our environment, especially when carrying out field work involving animals - Understanding the importance of the role of science in the future of our planet and how we can make positive contributions at home and at school (eg. through recycling, conserving energy and reducing waste) - Taking the interests of others into account when presenting or sharing work - Supporting peers and team members when enquiries are not going as planned, and helping them to find solutions
Perseverance	- Coping with setbacks, especially when carrying out scientific investigations - Making repeated small changes to scientific enquiries, persevering until solutions are found and an outcome is reached - Collecting data over extended periods of time eg. when finding out the best conditions for growing plants - Maintaining attention and clarifying information when being introduced to new and complex scientific knowledge such as magnetism, evolution and light
Reflectiveness	- Using results gathered as part of enquiries to draw simple conclusions - Suggesting improvements for completed tasks and raising further questions in light of new evidence - Considering the scientific evidence provided by the work of famous scientists and how this might influence their work
Cooperation	- Planning and carrying out scientific enquiries as a team, working collaboratively and sharing roles fairly - Presenting and sharing work with others, both written and oral - Working collaboratively and patiently when handling scientific equipment and resources which must be shared by the whole class - Contributing to whole class discussions and sharing observations and ideas to suggest answers to questions



Science: Curriculum Mapping and Key Knowledge:

Year group	Autumn	Spring	Summer
Year One	Seasonal Changes and Weather:  - What are the four seasons? - What's the weather like in Autumn, Winter, Spring and Summer? (E) - Why does day become night? Key Vocabulary: dawn, dusk, mild, rotate, soaked, weather, month, season, Spring, Summer, Autumn, Winter. Relevant Idioms and Colloquialisms: <i>Raining cats and dogs; under the weather.</i> Plants and Trees:  - What are the parts of plant? - What are wild plants and where do you find them? - What are garden plants and where do you find them? - What makes a tree? (E) - What types of tree are there around my school? - What's the difference between trees? Key vocabulary: bud, leaf, stem, root, bark, trunk, branch, seed, wild, nutrients, stem, deciduous, evergreen. Relevant Idioms and Colloquialisms: <i>Can't see the woods for the trees; offer an olive branch.</i> Animals including Humans:  - What is an animal? - What types of animal are there? - What is similar and what is different? - What does food tell us about an animal? - What makes me an animal? What type of sense do I have? Key vocabulary: blood, senses, feathers, fur, young, scales, mammal, amphibian, reptile, herbivore, carnivore, omnivore. Relevant Idioms and Colloquialisms: <i>Don't count your chickens before they are hatched.</i>	Everyday Materials:  - What are materials? - What are things made of in school? (E) - How can I describe materials? - Which materials are waterproof and which are not? - Which materials are transparent and which are opaque? - What's the best material for the job? Why? Key vocabulary: absorb, rough, smooth, waterproof, metal, plastic, materials, properties, flexible, transparent, opaque, physical. Relevant Idioms and Colloquialisms: <i>Take the rough with the smooth.</i> Revisit Animals Including Humans  - Describe it: What features do animals have? - Describe it: What are the features of mammals / birds / amphibians / reptiles / fish - Sort it: What does food tell us about an animal? - Sort it: What makes me an animal? What types of senses do I have? Key vocabulary: blood, senses, feathers, fur, young, scales, mammal, amphibian, reptile, herbivore, carnivore, omnivore.	Revisit Plants:  - What do I remember about plants? - Remember: What are the parts of a plant? - Remember: What are deciduous and evergreen trees? Key vocabulary: bud, leaf, stem, root, bark, trunk, branch, seed, wild, nutrients, stem, deciduous, evergreen. Second Revisit Plants and Animals Including Humans: (Example)  - What are these animals like? - My mammal/ my bird / my amphibian / my fish - Remember: What are wild and garden plants? Secure key vocabulary as required.



Science: Curriculum Mapping and Key Knowledge:

Year group	Autumn	Spring	Summer
Year Two	<u>Living Things and their Habitats:</u>  - What is alive and what is not? - What do all living things have in common? (E) - Where do plants and animals live? - What plants and animals live in our local environment? (E) - What are food chains and how are they connected? - Why do plants and animals need each other? Key Vocabulary: thrive, depend, producer, consume, prey, predator, oxygen, nutrition, respiration, sensitivity, reproduction, excretion. Relevant Idioms and Colloquialisms: <i>Fit as a fiddle.</i> <u>Animals including Humans:</u>  - Remember: What is an animal? (E) - How do animals change as they mature? - How do we change as we mature? - What do all animals need to stay alive? - Keeping healthy: why do we exercise? - Keep healthy: why do we eat different types of food? Key vocabulary: healthy, survive, exercise, heart, lungs, muscles, hygiene, larva, pupa, vertebrates, invertebrates, metamorphosis. Relevant Idioms and Colloquialisms: <i>Keep body and soul together.</i>	<u>Uses of Everyday Materials:</u> - What are materials used for? (Categorise and compare wood, metal, plastic and glass). - What are materials used for? (Categorise and compare ceramics, rock, paper, card and fabric). - What happens when we squash, bend, twist or stretch material? (E) - What's the right material for the job? - What's the most absorbent material? - Who invented waterproofing? (E)  Key vocabulary: artificial, brittle, extracted, fabric, manufactured, natural, ceramic, durable, inflexible, reflective, rigid, translucent. Significant Individual: Charles Macintosh (inventor of the waterproof coat nearly 200 years ago). Relevant Idioms and Colloquialisms: <i>Having feet of clay; cut from the same cloth.</i>  <u>Revisit 1: Living Things and their Habitats and Everyday Materials</u> - What is it made from? - Compare: what is alive, what is not alive and what has never been alive? - What materials do our pets have or need? Why is that? (E) Key vocabulary: Secure key vocabulary as required.	<u>Plants:</u>  - How do seeds germinate and what happens? - What happens when bulbs sprout? - What do plants need to thrive and be healthy? - What can happen if plants don't get the things they need? (E) - What do I notice about plants around the school? How are they healthy? How are unhealthy? (E) - How do seeds and bulbs grow? What do plants need to be healthy? Key vocabulary: wither, dormant, mature, bulb, anchor, sustain, germination, perennial, carbon dioxide, glucose, clone. Relevant Idioms and Colloquialisms: <i>Like two peas in a pod.</i>  <u>Second Revisit: Plants and Animals Including Humans: (Example)</u> - Explain it: How do seeds and bulbs grow? - Summarise it: What do I know about animals, including humans? - Explain it: What do plants and animals need to be healthy? Secure key vocabulary as required.



Science: Curriculum Mapping and Key Knowledge:

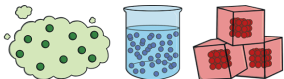
Year group	Autumn	Spring	Summer
Year Three	Rocks: - How are rocks formed? - What types of rocks are there? - Can rocks change? (E) - How can we test a rock to see if it is limestone or chalk? (E) - Is soil just dirt? What makes soil? - How are fossils formed? - Elaborate and remember: Rocks, soils and fossils. (E) Key Vocabulary: <i>cemented, compacted, decay, prehistoric, soil, transform, fossil, igneous, magma, metamorphic, minerals, sedimentary.</i> Relevant Idioms and Colloquialisms: <i>Caught between a rock and a hard place.</i> Animals including Humans: - What effect does the food we eat have? - Where is my skeleton and what does it do? - Where are my muscles and what do they do? Key vocabulary: <i>minerals, skeleton, skull, voluntary, involuntary, nerves, biceps, triceps, vertebrae, vitamins, proteins, carbohydrates.</i> Relevant Idioms and Colloquialisms: <i>Make no bones about it.</i> Revisit and Retrieve: Rocks - How are rocks formed and what types are there? - Remember: How can rocks change? - Remember: How are fossils formed and how do we know? Key vocabulary: <i>Secure key vocabulary as required.</i>	Forces and Magnets: - What are contact forces? - How do surfaces affect the motion of an object? - How does friction affect moving objects? - What is a non-contact force? How is this different to a contact force? - How do magnets attract and repel? - Which materials are magnetic? (E) Key vocabulary: <i>consequence, contact, force, attract, north, south, magnet, resistance, friction, repel, pole, magnetic field</i> Relevant Idioms and Colloquialisms: <i>When push comes to shove; opposites attract.</i> Plants: - What are the parts of a flowering plant? What do they do? - Do all plants need the same things to thrive and grow? (E) - How do leaves make food for the plant? - How does water move through a plant? - What do flowers do? - What is pollination? Key vocabulary: <i>adapt, essential, glucose, transport, variety, vital, transpiration, stoma, pollination, stamen, pistil, photosynthesis.</i> Relevant Idioms and Colloquialisms: <i>The grass is always greener on the other side of the fence.</i>	Light: - Do we need light to see things? Remember: What are light sources and what are not light sources? - How are shadows formed? - What happens to the size of a shadow when the object moves closer to, or away from, the light source? Key vocabulary: <i>absence, cast (shadow), impenetrable, reflect, shadow, source (light), constant, dependent, independent, illuminate, translucent, variable.</i> Relevant Idioms and Colloquialisms: <i>In someone's shadow.</i> Second Revisit and retrieve: Animals Including Humans: Secure key vocabulary as required.



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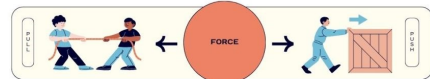
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Science: Curriculum Mapping and Key Knowledge:

Year group	Autumn	Spring	Summer
Year Four	<u>Living Things and their Habitats:</u>  - What are the characteristics of living things? (E) - What animals are vertebrates? - What animals are invertebrates? - What groups are plants classified in? - What is classification? How do I use a key? - What happens if the environment in a habitat changes? Key Vocabulary: <i>classification, environment, interdependence, interact, beneficial, hierarchy, vertebrate, invertebrate, biotic, ecosystem, species, niche.</i> Relevant Idioms and Colloquialisms: <i>Like a fish out water; in the dog house.</i> Significant Individual: <i>Carl Linnaeus (invented the way to classify living things in 1737 through taxonomy).</i> <u>States of Matter:</u>  - What is matter? What does 'state' mean? - What are solids, liquids and gasses? - Melting: How do materials change state? - Evaporating: How do materials change state? - Condensing: How do materials change state? - Summary: How do materials change their state of matter? (E) Key vocabulary: <i>permanent, particle, solid, liquid, gas, vapour, evaporate, condense, melt, matter, state, volume.</i> Relevant Idioms and Colloquialisms: <i>Cooking on gas; out of gas; be in/get into a state.</i>	<u>Animals Including Humans:</u>  - What teeth do humans have? - What do they do? - How does our mouth and teeth help digestion? What's the process? (E) - Can teeth tell us what animals eat? - What are the parts of the digestive system? What do they do? - How does digestion work? What's the process? - What are food chains? How do they work? - How do I construct and interpret a food chain? - SUMMARY: How are teeth, digestion and food chains connected? (E) Key vocabulary: <i>expel, compact, digestion, acid, stomach, intestines, incisor, canine, molar, enzyme, saliva, peristalsis</i> Relevant Idioms and Colloquialisms: <i>Your bark is worse than your bite.</i> <u>Electricity:</u>  - What appliances use electricity? What sort of power makes them work? - Notice it: What are the everyday appliances that run on electricity (battery or mains)? - Name it: What are components in a simple series circuit? - Test it: What happens when a circuit is opened or closed? - Diagnose it: What are the effects are changing circuit components and batteries? Key vocabulary: <i>associate, identify, portable, effect, appliance, series, component, electrical insulator, electrical conductor, circuit, hypothesis, variable.</i> Relevant Idioms and Colloquialisms: <i>To have a short fuse.</i>	<u>Sound:</u>  - What is sound? - How does sound travel? - What is the pitch and loudness of sound? Key vocabulary: <i>produce, property, source, frequent, regular, affect, vibrate, pitch, volume, medium, vacuum, sound wave.</i> Relevant Idioms and Colloquialisms: <i>Fine tuning; a fair hearing; like the sound of one's own voice.</i> <u>Revisit: Living Things and their Habitats:</u> Secure key vocabulary as required. 



Science: Curriculum Mapping and Key Knowledge:

Year group	Autumn	Spring	Summer
Year Five	<u>Properties and Changes of Materials:</u>  - What properties do materials have? How do we use them? - What is a solution and what is a mixture? - How can we separate materials from a mixture? - How can we separate materials from a solution? (E) - What changes are reversible? - What changes are irreversible? (E) Key Vocabulary: <i>property, particle, separate, combine, recover, comparative, atom, molecule, chemical (changes), physical (changes, reversible, reaction).</i> Relevant Idioms and Colloquialisms: <i>acid test.</i> <u>Animals Including Humans:</u>  - What is the human timeline? - How do we change into adults? - How does human and animal lifespan compare? (E) Key vocabulary: <i>development, diverse, unique, generation, mature, equipped, adolescence, puberty, gestation, embryo, foetus, womb.</i> Relevant Idioms and Colloquialisms: <i>Long in the tooth.</i>	<u>Forces:</u>  - When is friction helpful and when is it not? - What's the effect of air resistance? - What's the effect of water resistance? - Who was Galileo Galilei? (E) - How do levers help us? - How do pulleys and gears help us? Key vocabulary: <i>opposite, reaction, advantage, displace, weight, mass, pulley, gear, pivot, fulcrum, lever, upthrust.</i> Significant Individual: <i>Galileo Galilei (1564-1642) - Italian astronomer and physicist, studied the science of motion.</i> Relevant Idioms and Colloquialisms: <i>A force to be reckoned with; a driving force.</i> <u>Earth and Space:</u>  - What are the planets in our solar system? - How does our view of the Moon change in a lunar month? - Why does the rotation of the Earth result in night and day? - Why is the Earth's tilt (axis) responsible for the seasons? - Review and summarise—present what you know about Earth and space. Key vocabulary: <i>luminous, phenomenon, attraction, approximately, relative, apparent, orbit, axis, crescent, gravitational, waxing, waning.</i> Relevant Idioms and Colloquialisms: <i>Once in a blue moon; on another planet.</i>	<u>Living Things and Their Habitats:</u>  - What's the difference between a mammal and an amphibian? - What's the difference between an insect and a bird? - What is similar and what is different between the life cycles of a mammal, an insect, an amphibian and a bird? - Who was Maria Merion and what did she do? (E) - The science of life—how do living things reproduce? - Plants and animals: What's the life process of reproduction? Key vocabulary: <i>deduce, process, re-form, transform, adolescence, contrast, embryo, sexual, asexual reproduction, metamorphosis, incubate, biochemical, fertilisation, rhizome, tuber, bulb, runner (plant), ovule, clone.</i> Significant Individual: <i>Maria Merion (born 1647) - German entomologist.</i> Relevant Idioms and Colloquialisms: <i>Sitting on a nest egg; the prime of life.</i> <u>Revisit: Living Things and their Habitats:</u>  Secure key vocabulary as required.



Science: Curriculum Mapping and Key Knowledge:

Year group	Autumn	Spring	Summer
Year Six	Electricity: - What is electricity? How does it work? - Do it: How do we build and represent a series circuit? - What are the components in a series circuit? - Test it: How does the number of cells and voltage affect components in a series circuit? - Diagnose it: What are the effects and consequences of changing circuit components and batteries? Key Vocabulary: <i>component, consequence, systematic, represent, source, generate, proton, neutron, electron, terminal, series, potential difference.</i> Relevant Idioms and Colloquialisms: <i>off the grid, self-sufficient.</i> Animals Including Humans: - What is blood made of and why do we need it? - Why do our bodies need nutrients and how are they transported? - What is our circulatory system? - What is our heart like inside? How does it work? - Who influenced what we know about our circulatory system? (E) - What can we do to keep healthy? - Present and explain: What do I know about the circulatory system, nutrients and keeping healthy? € - Circulation and digestion: How are these two systems connected? - Where are the kidneys and what do they do? - How do kidneys help keep us healthy? Key vocabulary: <i>cell, chamber, system, circulation, vessel, clot, plasma, platelet, artery, capillary, vein, ventricle, kidney bladder, urine, excretion, toxin, nutrient, regulate, expel, filter, function, substance.</i> Significant Individual: <i>Galen (AD 157) - chief physician to gladiators in Pergamon; William Harvey (1602) - English physician to King James 1.</i> Relevant Idioms and Colloquialisms: <i>It's in your blood;</i>	Light: - How does light travel? - What colour is light made of? - Reflection: How does light help us to see objects? - Which surfaces make the best reflectors? - Why do we see objects as a particular colour? - What happens to the appearance of objects when placed in water? Key vocabulary: <i>impurity, emit, absorb, constituent, filter, artificial, refraction, incidence, spectrum, prism, lux, pigment.</i> Significant Individual: <i>Sir Isaac Newton (described the visible spectrum of light in 1671).</i> Relevant Idioms and Colloquialisms: <i>Light at the end of the tunnel; leading light.</i> Living Things and their Habitats: - Who was scientist Carl Linnaeus and what did he do? - How do we classify vertebrates? - How do we classify invertebrates we know? - How do we classify invertebrates we don't know? (E) - What are microorganisms? - How do I classify plants? Key vocabulary: <i>characteristic, interdependence, specific, categorise, primitive, hierarchy, fungus, anthropod, taxonomy, kingdom, phylum, genus.</i> Significant Individual: <i>Carl Linnaeus (invented the way to classify living things in 1737 through taxonomy).</i> Relevant Idioms and Colloquialisms: <i>A snake in the grass; worm your way in.</i>	Evolution and Inheritance: - How have living things changed over time? How do we know? - How has life evolved over time? - What is DNA and what does it do? - Are all offspring identical to their parents? (E) - Darwin and Wallace: What evidence did they share to argue the case for evolution? - Survival of the fittest: How have animals adapted and evolved to suit their environment? Key vocabulary: <i>characteristic, adaptation, acquire, theory, modify, generation, evolve, survival, species, clone, inherit, fossil.</i> Significant Individuals: <i>Alfred Wallace and Charles Darwin—Theories of evolution (1859 and 1858).</i> Relevant Idioms and Colloquialisms: <i>Follow in the footsteps.</i>



Working Scientifically Skills Progression:

Year group	Ideas and Questions:	Planning Investigations:	Observing and Presenting:
Years One & Two	- Ask simple questions and recognising that they can be answered in different way. - Recognise scientific and technical developments that help us.	- Perform simple tests or follows teachers' instructions - With guidance, suggest what I will do to explore a theme or test a scientific question. - Identify things to measure or observe that are relevant to the question. - Use resources provided or choose from a limited range. - Use simple measurements and equipment to gather data. - Suggest why a test may be unfair.	- Observe closely (including changes over time), using simple equipment. - Take and record measurements using non-standard units. - Use simple secondary sources to find answers. - Gather simple data to help answer questions. - Record findings in a range of ways, eg. simple tables, diagrams, pictograms, sorting circles, bar charts and templates. - Talk about my findings using everyday terms, text scaffolds or simple scientific language
Years Three & Four	- Ask relevant questions and using different types of scientific enquiries to answer them. - Explain the purposes of a variety of scientific and technological developments.	- Set up simple practical enquiries, comparative and fair tests. - Begin to make decisions about what observations to make and how long to make them for. - Begin to choose the type of simple equipment that might be used from a reasonable range. - Use appropriate equipment and measurements with reasonable accuracy. - Recognise when a simple fair test is needed. - With support, decide how to set up a fair test and control variables to yield reliable data.	- Make systematic and careful observations. - Take accurate measurements using standard units, using a range of equipment. - Recognise when and how secondary sources might help answer questions that cannot be answered through practical investigations. - Gather and record data in a variety of ways. - Make decisions about how to record and analyse the data and prepare own formats for recording. - Record and presents findings using drawings, labelled diagrams, keys, tally charts, Carroll diagrams, Venn diagrams, bar charts and tables. - Report on findings from enquiries, in simple scientific language.
Years Five & Six	- Use my scientific experiences to explore ideas and raise different types of questions. - Talk about how scientific ideas have developed over time and why. - Recognise the applications of specific scientific ideas.	- Select and plan different types of scientific enquiries to answer questions. - Make decisions about what observations to make, what measurements to use, how long to make observations for and whether or not to repeat them. - Choose the most appropriate equipment to take accurate measurements. - Explain how to use scientific equipment accurately. - Recognise when and how to set up comparative and fair tests. - Recognise and controls variables where necessary (eg. Explain which variables need to be controlled and why).	- Take measurements, in standard units, using a range of scientific equipment, with increasing accuracy and precision. - Take repeat readings when appropriate. - Recognise which secondary sources will be most useful to research their ideas. - Begin to separate scientific opinion from fact. - Record data and results of increasing complexity, making own decisions about how to record. - Calculate mean value where appropriate. - Record and present findings using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. - Report on findings from enquiries, using relevant scientific language, in oral and written explanations such as displays and other presentations.



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Working Scientifically Skills Progression:

Year group	Identifying Patterns and Trends:	Interpreting and Explaining Results	Concluding and Evaluating:
Years One & Two	- Use simple observable features to compare objects, materials and living things - Identify and classify (decides how to sort and group objects) - With guidance, begin to notice changes (ie. cause and effect), patterns and relationships (ie. how one variable affects another)	- I can talk about what I have found out and how I reached my findings. - I can use my observations and ideas to suggest answers to research questions - Use comparative language to describe changes, patterns and relationships.	- With support, I can suggest whether or not what happened was what I expected. - I can suggest different ways I could have done things.
Years Three & Four	- Use observable and other criteria to group, sort and classify in different ways (including simple keys and branching databases) - Identify differences, similarities or changes related to simple scientific ideas and processes - With support, I can look for changes, patterns, and relationships in data sets I have collected.	- From my results, I am able to draw simple conclusions and answers questions using an appropriate level of knowledge. - Use straightforward scientific evidence to answer questions or to support my findings. - I can use relevant scientific language to discuss my ideas and communicate my findings to others.	- Use results to suggest improvements to what I have done. - I can raise further questions (eg. arising from my findings). - With support, I can make predictions for new values within or beyond the data collected.
Years Five & Six	- Use and develop keys and other information records to identify, classify and describe living things and materials. - Identify conclusions, causal relationships and patterns.	- I can draw valid conclusions, and explain and interpret results (including the degree of trust) using scientific knowledge and understanding - I can recognise potential limitations/faults or anomalies in data. - Identify scientific evidence that has been used to support or refute ideas or arguments. - Use relevant scientific language and illustrations to discuss, communicate and justify my scientific ideas.	- I can make practical suggestions about how my working method could be improved (eg. the effect of sample size on reliability). - Use results to identify when further tests and observations might be needed. - Use test results to make predictions and to set up further comparative and fair tests.



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Science: Biology Skills Progression:

Year group	Plants	Animals Including Humans	Living Things and Their Habitats
Year 1/2 Cycle A	<u>In the Garden</u> - Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees, including the influence of seasons. - Identify and describe the basic structure of a variety of common flowering plants, including trees. - Identify the leaf, root, stem and flower of a plant. - Identify the trunk, branch, roots and leaves of a tree. - Sequence pictures that show how plants change over time. - Identify some common flowers, plants and trees in my locality.	<u>Different Animals</u> - identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals - identify and name a variety of common animals that are carnivores, herbivores and omnivores - describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets) - identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	
Year 1/2 Cycle B	<u>Growing Plants</u> - Observe and describe how seeds and bulbs grow into mature plants - Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. - Identify that seeds and bulbs do not need light to germinate and identify how this is different to the needs of a plant - Explain how some plants are able to survive in harsh conditions. - Identify the similarities and differences between different bulbs and seeds. - Identify the features of an unhealthy plant. - Describe the life cycle of a bulb.	<u>Growth and Survival</u> - notice that animals, including humans, have offspring which grow into adults. - recognise changes that take place as animals get older. - find out about and describe the basic needs of animals, including humans, for survival. E.g. MRS GREN - describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. - Recognise how we change as we mature.	<u>Habitats</u> - explore and compare the differences between things that are living, dead, and things that have never been alive - identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants - identify and name a variety of plants and animals in habitats and microhabitats - describe how animals obtain their food from plants and other animals, using the idea of a simple food chain - identify and name different sources of food. - Know and explain what a simple food chain is including the direction of energy.
Year 3/4 Cycle A	<u>Investigating plants</u> - Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers - Explore the requirements of plants for life and growth (air, light, water, nutrients, room to grow) and how they vary plant to plant - Investigate the way in which water is transported within plants - Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and dispersal. - Describe the process of photosynthesis. - Identify the male and female parts of some flowers.	<u>Healthy Eating and Healthy Bodies</u> - identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat - identify that humans and some other animals have skeletons and for support, protection and movement. - identify and group animals with and without skeletons, comparing their movement. - compare and contrast the diets of different animals, and decide ways of grouping them according to what they eat. - Know and explain the difference between vertebrates and invertebrates. - Know, identify and explain the purpose and function of the muscles, such as skeletal, cardiac or smooth muscles.	



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Science: Biology Skills Progression:

Year group	Evolution and Inheritance	Animals Including Humans	Living Things and Their Habitats
Year 3/4 Cycle B		<u>Teeth and Digestion</u> - Identify the different types of teeth in humans and their simple functions - Know and identify the parts and functions of the human digestive system., such as the mouth, tongue, teeth , oesophagus, stomach, small and large intestine. - Find out what damages teeth and how to look after them. - Compare the teeth of carnivores and herbivores and suggest reasons for the differences.	<u>Classification and Interdependence</u> - Recognise that living things can be grouped in a variety of ways, such as vertebrate or invertebrate and flowering and non-flowering plants. - Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment - Recognise that environments can change and that this can sometimes pose dangers to living things. - Construct and interpret a variety of food chains, identifying producers, predators and prey. - Identify the way habitats change over the year. - Explore impacts that humans can have on the environment (both positive and negative. - Know and use classification keys to group, name and identify a variety of living things in my local environment.
Year 5/6 Cycle A		<u>Human Life Cycles</u> - Know, describe and explain the changes humans go through to old age. - Know and use a timeline to show stages of growth and development of humans, including puberty. - Know, explain and compare the gestation periods of humans to other animals, such as an elephant or butterfly.	<u>Life Cycles</u> - Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird - Describe the life process of reproduction in some plants and animals. - Investigate the lives of famous naturalists (e.g. Maria Merion who David Attenborough described as one of the most important contributors to entomology). - Explore different types of reproduction, including sexual and asexual reproduction
Year 5/6 Cycle B	<u>Evolution and Inheritance</u> - Know and explaining that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago, such as body fossils, mould fossils, cast fossils and trace fossils - Know and explain that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents - know, identify and explain how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution - know and explain about significant scientists who have helped us understand the theory of evolution, such as Alfred Wallace and Charles Darwin	<u>Humans and Health</u> - Know, identify and explain the main parts of the human circulatory system and describe the functions of the heart, aorta, pulmonary vein, left atrium, right atrium, left ventricle, right ventricle, arteries, veins and capillaries, oxygenated and deoxygenated. - Know, identify and explain the components and function of blood, such as plasma, red blood cells, white blood cells, platelets, nutrients and oxygen. - Know and explain the impact of diet, exercise, drugs and lifestyle on the way their bodies function. - Know, describe and explain the ways in which nutrients and water are transported within animals, including humans. - Know and explain how significant scientists helped us understand more about the circulatory system, such as Galen or William Harvey	<u>Classification</u> - Know and explain how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals - Know and identify the five major kingdoms of living things, including plant, animal, fungi, algae, slime and mould, and bacteria - Know and explain how significant scientists, such as Aristotle or Carl Linnaeus, helped us understand more about classification - Know use and explaining taxonomy - Know and explain reasons for classifying plants and animals based on specific characteristics, such as vertebrates or invertebrates - Know and use classification systems and keys to identify some animals and plants in the immediate environment - Know how to classify animals and plants they are unfamiliar with using a classification system



Science: Chemistry and Physics Skills Proaression:

Year group	Materials (Chemistry)	Light and Sound (Physics)	Forces and Electricity (Physics)
Year 1/2 Cycle A	<u>Everyday Materials</u> - distinguish between an object and the material from which it is made, such as metal and a spoon. - identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock - describe the simple physical properties of a variety of everyday materials, such as hard, soft, bendy, stiff, rigid, waterproof, not waterproof, absorbent, not absorbent, opaque, translucent, transparent. - Compare and group together a variety of everyday materials on the basis of their simple physical properties. - Perform simple tests to explore which material would be best suited to a specific purpose.		<u>The Seasons:</u> - Know and explain the order of the seasons. - Know and explain the changes within each season, including months of the year. - Know and appreciate different weather patterns and explain, for example, how rainfall can occur in all seasons. - Know that the Earth rotates and explain how day and night occurs.
Year 1/2 Cycle B	<u>Uses of Everyday Materials</u> - Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses - Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. - Recognise why it is important to recycle and reuse plastic - Describe how scientists have invented new materials (eg. Charles MacIntosh).		
Year 3/4 Cycle A	<u>Rocks, Fossils and Soils</u> - compare and group together different kinds of rocks on the basis of their appearance and simple physical properties - begin to understand how igneous, sedimentary and metamorphic rocks are formed. - Know what is and what is not a rock. - Relate the simple physical properties of some rocks to their formation. - Explore that different rocks react differently to forces (eg. rubbing, water) - Describe in simple terms how fossils are formed and explain different types of fossils (including body and trace). - recognise that soils are made from different types of material, including rocks and organic matter.	<u>Light and Shadow</u> - Know and explain that light is needed in order to see things. - Know and explain that dark is the absence of light. - Name a number of light sources, including the sun - Describe how light is reflected from surfaces and enters our eyes. - Explore the way light is reflected from a mirror - Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. - Recognise that shadows are formed when light is blocked by an opaque object. - Find patterns in the way that the size of shadows change in relation to the light source.	<u>Forces and Magnets</u> - Understand different types of forces, including pushes, pulls, gravity and friction. - Compare how things move on different surfaces using friction and resistance to explain why. - Notice that some forces need contact between two objects, but magnetism can act at a distance - Observe how magnets attract or repel each other and attract some materials and not others - Compare and group together everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials - Describe magnets as having two poles - Predict whether two magnets will attract or repel, depending on which poles are facing.



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Science: Chemistry and Physics Skills Progression:

Year group	Materials (Chemistry)	Light, Sound and Earth and Space (Physics)	Forces and Electricity (Physics)
Year 3/4 Cycle B	States of Matter - Know and explain what matter and state mean - Use simple models to explain what particles are. - Know and explain the difference between solids, liquids and gases. - Observe and know that some materials change state when they are heated or cooled, such as water evaporating or butter melting. - Know and use degrees Celsius ($^{\circ}\text{C}$) as a measure of temperature. - Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	Sound and Vibration - Know and identify how sounds are made through vibrations and travel as waves. - Know and explain how sounds travel through a medium, such as a solid, a liquid or a gas. - Know and explain that sound is the transfer of energy. - Define the terms pitch and loudness. - Find patterns between the pitch of a sound and features of the object that produced it, such as an elastic band. - Find patterns between the volume of a sound and the strength of the vibrations that produced it, such as the bang of a drum. - Recognise that sounds get fainter as the distance from the sound source increases.	Circuits and Components - Identify household appliances that run on mains electricity and describe some of the dangers of mains electricity. - Identify different appliances that run using batteries. - Construct a simple series electrical circuit, identifying and naming basic parts, including cells, wires, bulbs, switches and buzzers. - Identify whether or not a lamp will light in a simple series circuit, based on whether it is part of a complete loop with a battery. - Know that a switch can open/close a circuit - Recognise some common conductors and insulators, and associate metals with being good conductors. - Know that the current is the flow of electricity through a circuit.
Year 5/6 Cycle A	Changing Materials - Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. - Know and explain how some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. - Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. - Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. - Demonstrate that dissolving, mixing and changes of state are reversible changes. - Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	Earth and Space: - Know and identify the eight planets in our solar system - Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune - Know and identify Pluto as a dwarf planet. - Know, identify and explain the movement of the Earth and other planets, relative to the Sun in the solar system. - Know and explaining the movement of the Moon relative to the Earth. - Know and explain that a moon is a celestial body that orbits a planet, such as the Moon around Earth or the four large moons of Jupiter - Io, Europa, Ganymede and Callisto first seen by Galileo Galilei. - Know and explain that the Sun, Earth and Moon are approximately spherical bodies. - Know about Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	Forces - Recognise that more than one force can act on an object - Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object - Know and explain how significant scientists such as Isaac Newton helped develop the theory of gravitation. - Identify the effects of air resistance, water resistance and friction between moving surfaces. - Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect known as a force multiplier. - Explore how levers, pulleys and gears are used in everyday life (e.g. describe how having gears can make it easier to pedal a bike) - Know and experience how levers, pulleys and gears multiply a smaller force to achieve a greater effect, such as removing a nail using a claw hammer, making simple pulleys and gears on a bike
Year 5/6 Cycle B		Light - Recognise that light appears to travel in straight lines - Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. - Draw diagrams to illustrate how light is travelling from the source to the eye. - Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes - Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. - Know that, when sunlight passes through some objects, coloured light is produced (for example in rainbows, soap bubbles and prisms).	Electricity - Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit - Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches - Use recognised symbols when representing a simple circuit in a diagram. - Explore the thickness of a wire in a circuit - Know how to stay safe when using electricity